

views on the formation of images in the microscope had received the advantage of his personal and later revision ; but it is none the less due to the authors to acknowledge the credit that is justly theirs, for the very early recognition of the value of his investigations ; and for the earnest manner in which they endeavoured to embody those investigations in a popular text-book at a date (1877) when hardly more than the barest outlines of the subject had been published by Prof. Abbe himself.

We note that the authors give the preference to daylight over lamp-light, believing that it exerts less strain upon the eye. We suspect that the majority of English observers, especially at continuous work, and with high powers, will be inclined to reverse this judgment. Extremely white and intense light can be obtained from good modern lamps, and, unlike daylight, it is unvarying, devoid of caprice, and easy of manipulation. But this is a matter, perhaps, in some sense subjective, and not of vital moment.

The world of science generally and of microscopical science in particular, is deeply indebted to Mr. Crisp for initiating this translation, which, we have taken pains to find, is most carefully done ; and to Mr. Mayall for his part of the laborious undertaking. We can only hope, in the interests of English and American science, that it will find a large circle of careful readers on both sides of the Atlantic ; and we warmly concur in the hope expressed in the preface, "that the volume may be supplemented before long by an English version of the further researches in microscopical optics by Prof. Abbe, of Jena, which have extended so much our knowledge of the matters dealt with in Naegeli and Schwendener's work."

W. H. DALLINGER.

THE CRUISE OF THE "DIJUMPHNA."

The Cruise of the "Dijumphna." With Reports of the Zoological and Botanical Results of the Voyage. By R. Bergh, J. Deichmann Brandt, J. Collin, H. Hansen, T. Holm, C. Jensen, G. Levinsen, C. Lütken, L. K. Rosenvinge, M. Traustedt, and N. Wille. (Copenhagen, 1887.)

THE Danish Arctic Expedition of 1882-83 owes its initiative to its able commander, Lieut. Hovgaard, of the Danish Navy. This enterprising officer, whose practical experience of Arctic navigation gave great weight to his opinions on the subject, had early in 1882 published a pamphlet, entitled "Suggestions for a Danish Polar Expedition," in which he advocated his own theories regarding the distribution of land and water in the Arctic regions, and the feasibility of finding some hitherto untried route for circumpolar exploration.

In response to his appeal for means to test the accuracy of his opinions, a private individual, Herr Gamél, of Copenhagen, placed at his disposal a screw-steamer, since known as the *Dijumphna*, whose equipment for Polar explorations and scientific observations was supplemented at the expense of the Danish Ministry of Marine.

Thus well prepared, the Expedition left the Copenhagen Roads, July 18, 1882, but unfortunately the *Dijumphna* early encountered ice, which was found to be so dense

south of Cape Tschernui Noss that it was only after a delay of more than four weeks off the south-west coasts of Nova Zembla, that an entrance could be made into the Sea of Kara, where, in accordance with Hovgaard's anticipations, the water was clear. The hopes of success to which this fact gave rise proved, however, delusive, for the ice began to re-form so rapidly that, within a few days of their passage into the Kara Sea, it had become apparent that the *Dijumphna* was fast bound for the coming winter ; and it was only after nearly a twelve-month's detention that the ice began to loosen, when the westerly trend of the drifts carried the ship, in the August of 1883, back towards the entrance of the Sea of Kara. With a broken screw and failing supplies, there was no alternative but to renounce all hope of advancing further east, and, accordingly, by help of sails the *Dijumphna* began its homeward voyage, which was so retarded by ice-drifts and storms that the harbour of Copenhagen was not reached till December 3, 1883.

In the course of the winter the sun remained below the horizon from November 20 to January 22, the temperature at the latter date falling as low as $-47^{\circ}9$ C.; while there was constant danger of being crushed in the ice, or carried with moving drifts on the shore. Yet, notwithstanding these drawbacks, the trawl and dredge were diligently used at 190 different stations, ten of which were in the Jugor Schar and in Olenje Sound, off the south-west coast of Nova Zembla. Most of the deep-sea soundings were carried on in the Sea of Kara, between $69^{\circ}42'$ N. lat., $64^{\circ}45'$ E. long., and $71^{\circ}46'$ N. lat., $65^{\circ}14'$ E. long., within which limits the ship was moved forward and backward by the ice-drifts. This ground proved specially rich, and Herr Holm, the efficient naturalist of the Expedition, was able to bring home an exceptionally large number of well-preserved botanical and animal collections, which now form a valuable addition to the contents of the Danish National Museum, to which they have been generously ceded by Herr Gamél, the owner of the *Dijumphna*.

Herr Holm's report of the flora of Nova Zembla, which he examined at twelve distinct localities during the *Dijumphna's* long detention off the coast, confirms the statement of Von Baer as to the abundance of vegetation on the tundras, but he differs from him in regard to the mode in which plants found their way into these high latitudes. According to Von Baer, to whose report of his scientific mission, undertaken for the Russian Government in 1837, we are indebted for our first acquaintance with the Nova Zembla flora, its plants have all been stranded from neighbouring shores through the agency of drifting ice. Herr Holm, on the other hand, believes that a few forms may be survivals from pre-glacial periods, but that the presence of the majority is due partly to the agency of birds, of which large numbers, more especially *Tringa* and other waders, frequent the shores, and partly to the winds, and to ice-drifts. Insects are too rare to affect the question of plant-propagation, and his observations—that most plants on the tundras have the corolla directed upwards, while pendent or drooping forms are very rare, and that the majority are scentless, and of one uniform colour—appear to favour these views ; although it is possible that the existing flora may also to some extent be due to self-fertilization.

The general appearance of the tundras is that of a slightly irregular plain, the irregularities being due to the tuft-like character of the patches of vegetation, which are separated by pools and streams of melting ice, from which innumerable mosses emerge. When closely examined, these tufts are found to consist of plants dwarfed out of all resemblance to their more southern congeners; thus, *Salix polaris* never rises more than 2 inches in height, although the number of its annual layers of growth—consisting only of five to six cells—may indicate an age of thirty years. Considered generally, the Nova Zembla flora consists of twenty-eight families of Dicotyledons, four Monocotyledons, and four Cryptogams. Among the Phanerogamæ the most largely represented are the Gramineæ, of which thirty-one species have been distinguished. Curiously enough, it is found that contrary to their habits in more southern regions the Dicotyledons flower earlier than Monocotyledons, which contribute the larger proportion of the flora of the tundras, both as regards species and individuals. The number of new phanerogamic forms derived from the *Dijumphna* Expedition scarcely exceeds a dozen, and of these the most interesting are *Salix arctica*, *Glyceria tenella*, *Potentilla emarginata*, and three species of *Carex*, viz. *C. incurva*, *lagopina*, and *hyperborea*. As many as eight species of *Saxifraga* were met with, while *Phaca* is the only representative of Papilionaceous plants.

Special interest attaches to the collection of mosses brought home by Herr Holm, and examined by Herr C. Jensen, whose report shows that among the entire sixty-four species, of which fifty-one belonged to the tundras and the cliffs of Nova Zembla, three were genuine Arctic forms, viz. *Voitia hyperborea*, *Bryum obtusifolium*, and *Amblystegium brevifolium*. In Wulfborg's report of the mosses collected in the Norwegian Expedition of 1872, which is the only other notice of the Arctic Cryptogams, only twenty-four are noted, so that we owe our acquaintance with forty species to the industry of the *Dijumphna*'s collectors. Herr Holm was equally fortunate in finding hitherto unrecorded fresh-water Algæ in South-West Nova Zembla; but in regard to the marine Algæ he has little to record that had not been previously made known, while he corroborates the statements of earlier explorers as to the luxuriant profusion of gigantic Laminariæ, which fringe the coasts at a depth of from 1 to 5 fathoms, where he obtained fronds of *Alaria esculenta* more than 15 feet long.

In passing to the consideration of the zoological results of the *Dijumphna* Expedition, we must admit that excepting in regard to the Invertebrata, for whose capture no better hunting-grounds than such Laminarian forests can be wished for, the results are negative rather than positive. Of the higher marine Vertebrates only *Phoca fatida* and *Odobenus rosmarus* were seen. A few foxes were noted, and a young she-bear was shot, which was the only specimen of big game attainable. Fishes, mostly belonging to Icelus, Lycodes, and Liparis, were taken so sparsely in from 49 to 106 fathoms that only twenty-eight out of the entire 190 trawls yielded a single specimen. In regard to the Invertebrates the yields were, however, enormous, showing an astonishing abundance of animal life in the Arctic waters. Thus, one haul brought up 928 specimens of *Glyptonotus entomon*, 300 of *G. Sabini*,

besides enormous numbers of Alcyonidæ, Sponges, Actinias, and other Polyp forms. Nor was this an exceptional case. In the Sea of Kara the Echinodermata ranked first as to individual numbers, but Crustaceæ as to species, eighty-two of the latter having been determined, of which ten belonged to the family of the Pycnogonidæ. Among Crustaceans generally, seventeen new species have been established by Herr Hansen, whose report supplies much interesting and novel information in regard to the structure of the foot-jaws of the Isopoda, of which he proposes to treat more in detail in a special monograph on the buccal organs and antennæ of the most important Crustacean types.

Gastropods and Annelids were of rare occurrence, and only one genus of Cephalopods, *Rossia*, was observed. The Simple Ascidians, which have been carefully studied and reported on by Dr. Traustedt, have relatively speaking yielded many novel results, while five of the eight species collected are new, of which the most interesting are *Phallusia dijumphniana* and *P. glacialis*.

The volume in which the various reports on the *Dijumphna* collections are contained is well got up, like other works of a similar character that have been brought out under the joint co-operation of the authorities of the National Museum of Denmark, and of the Carlsberg Institute. The latter of these bodies has liberally advanced the funds necessary for meeting the expenses of publication, in anticipation of the grant of 10,000 kroner to be voted for the purpose in the next year's Parliamentary Budget.

The work has been carefully edited by Herr Lütken, who contributes the monograph on the fishes, and to him foreign readers are indebted for a French *résumé* of the report on the vegetation of Nova Zembla, and for a general summary of the fauna of the Sea of Kara in the same tongue. Besides his very complete botanical reports, Herr Holm contributes a short prefatory account of the cruise, which, if it unfortunately failed in adding to our geographical knowledge of the Arctic regions, has at any rate supplied naturalists with much valuable material towards a closer acquaintance with the conditions and forms of vegetable and animal life in those high latitudes.

EXERCISES IN QUANTITATIVE CHEMICAL ANALYSIS.

Exercises in Quantitative Chemical Analysis; and a Short Treatise on Gas Analysis. W. Dittmar, LL.D. (Glasgow: William Hodge and Co., 1887.)

IT has probably been the case with all books on practical chemistry, and especially quantitative analysis, that in the first instance a rough plan or outline of the work was used by the teacher in his laboratory, there to undergo a process of extension and development. In some cases this development has gone on until we have such classical compilations of tried analytical processes as Fresenius's quantitative or Crookes's special methods. This seems to be a natural plan. Try your plan on your own students, and, if there a success, publish for the possible benefit of a wider circle. There is only this difficulty,